CLAIMS:

1. Method for forming a strained Si layer on a substrate (1), comprising:
- formation of an epitaxial SiGe layer (4) on a monocrystalline Si surface,
- formation of said strained Si layer by epitaxial growth of said Si layer on top of said epitaxial SiGe layer (4), said Si layer having a strained state due to said epitaxial growth, characterized in that

said substrate (1) is a Silicon-On-Insulator substrate comprising a support layer (1), a buried silicon dioxide layer (BOX) and a monocrystalline Si surface layer (3), said method further comprising:
- ion implantation of said Si surface layer (3) and said epitaxial SiGe layer (4) to transform said Si surface layer (3) into an amorphous Si layer (3B) and a portion of said epitaxial SiGe layer (4) into an amorphous SiGe layer (5), a further portion of said epitaxial SiGe layer (4) being a remaining monocrystalline SiGe layer (6),

said amorphous Si layer (3B), said amorphous SiGe layer and said remaining monocrystalline SiGe layer (6) forming a layer stack (3B, 5, 6) on said buried silicon dioxide layer (BOX), with said amorphous Si layer (3B) being adjacent to said buried silicon dioxide layer (BOX).

2. Method for forming a strained Si layer on a substrate (1) according to claim 1, characterized in that said method further comprises patterning of said layer stack (3B, 5, 6) for forming active parts of a MOSFET structure.

3. Method for forming a strained Si layer on a substrate (1) according to claim 1 or 2, characterized in that said method further comprises:
- deposition of a silicon dioxide capping layer (SiO_2 cap) on said remaining monocrystalline SiGe layer (6);
- bonding of said substrate (1) to a second substrate (10), said second substrate (10) having a silicon dioxide surface layer (11), said silicon dioxide capping layer (SiO_2 cap) on said substrate (1) being face-to-face with said silicon dioxide surface layer (11);

- removing said support layer (1) by etching; and
- removing said buried silicon dioxide layer (BOX) by etching.

4. Method for forming a strained Si layer on a substrate (1) according to claim 1 or 2 or 3, characterized in that said method comprises:
- re-crystallizing of said amorphous Si layer (3B) and said amorphous SiGe layer by a solid phase epitaxy (SPE) regrowth process at an interface between said remaining monocrystalline SiGe layer (6) and said amorphous SiGe layer (5),
- said amorphous Si layer (3B) being transformed into an epitaxial strained Si layer (9; 9B) and said amorphous SiGe layer (6) being transformed into a re-grown crystalline SiGe layer (8; 8B).

5. Method for forming a strained Si layer on a substrate (1) according to claim 4, characterized in that said method comprises removal of said re-grown crystalline SiGe layer (8B) by etching.

6. Method for forming a strained Si layer on a substrate (1) according to any one of the preceding claims, characterized in that said strained Si layer (9; 9B) is a gate channel in a MOSFET structure.

7. Method for forming a strained Si layer on a substrate (1) according to any one of the preceding claims, characterized in that an annealing temperature during said solid phase epitaxy (SPE) regrowth process is substantially below 600 °C.

8. Method for forming a strained Si layer on a substrate (1) according to any one of the preceding claims, characterized in that said Si surface layer (3) has a thickness of less than 10 nm.

9. MOSFET structure comprising source, drain and gate, wherein said gate comprises a gate channel consisting of a strained Si layer (9; 9B); said strained Si layer (9; 9B) being manufactured by a method in accordance with any one of the preceding claims.

10. Semiconductor device comprising at least one MOSFET structure in accordance with any one of the preceding claims.